Brainwaves at the Beach: Coastal & Ocean Science Signage

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Brainwaves at the Beach: Coastal and Ocean Science Signage

A Final Report to the
Virginia Coastal Zone Management Program
Department of Environmental Quality
Commonwealth of Virginia
NOAA Grant NA18NOS4190152, Task 74

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Introduction

The Virginia Aquarium & Marine Science Center's (Aquarium) mission is *to inspire conservation* of the marine environment through education, research and sustainable practices. A significant component of the mission is to provide educational experiences – exhibits and programs – to more than 600,000 annual Aquarium visitors and more than 17,000 others, primarily students, through outreach programs.

The Aquarium and the Virginia Coastal Zone Management Program (CZM Program) worked together on this project to expand the impact of ocean science outreach experiences by developing three new *Brainwaves at the Beach* exhibits along the oceanfront in the resort area of Virginia Beach. The exhibits are designed to promote the goals of both entities and include interactive educational links to local and regional ocean conservation issues and planning initiatives.

The City of Virginia Beach's world-famous "boardwalk" provides access to 40 blocks (3 miles) along the resort beach and hosts more than 2 million people annually (photos below). Signs installed at each block announce where the visitor is and any upcoming events that might be of interest. Artistic and historical sculptures can be found at various points, as well. Families eager for entertainment attend oceanfront concerts, visit museums and duck in and out of the shops and restaurants along the boardwalk. This iconic location was chosen as an ideal setting for the innovative *Brainwaves at the Beach* exhibits.



Aerial view of oceanfront boardwalk in the City of Virginia Beach.



Oceanfront boardwalk in the City of Virginia Beach.

Design Development

With over thirty years of experience in creating hands-on exhibits, the Aquarium was uniquely qualified to develop and install these new exhibits on the Virginia Beach boardwalk. The staff has knowledge and experience with the design of interactive exhibits to withstand both high visitor traffic and the outdoor oceanfront environment.

Aquarium staff worked with CZM Program staff to research and develop three exhibit themes. Exhibit themes were chosen to enhance the boardwalk experience and raise public awareness about topics of importance related to ocean science, conservation, and sustainability. The exhibit themes are:

- What's Out There? this exhibit presents an introduction to the busy ocean off Virginia and the human activities and diverse marine life that can be found there.
- *Oceans of Plastic* this exhibit presents information on the most common forms of ocean plastic pollution and what steps people can take to address the problem.
- **Beaches on the Move** this exhibit illustrates how shifting sands, sinking land, and sea level rise are constantly changing coastal beaches like Virginia Beach.

Once the themes were finalized, exhibit content was developed for each topic area. Aquarium and CZM Program staff researched and reviewed written text and graphic elements for each

topic. Then Aquarium graphic designers developed exhibit panels designed to bring each thematic topic to life for the viewers.

The exhibit development team had always planned to include interactive elements in the exhibit designs. In the exhibit graphic panels, these elements include QR code links to additional content about the subject matter. These links allow exhibit viewers to explore topic areas in more detail, including gaining access to online resources that were not possible to include in the physical exhibits.

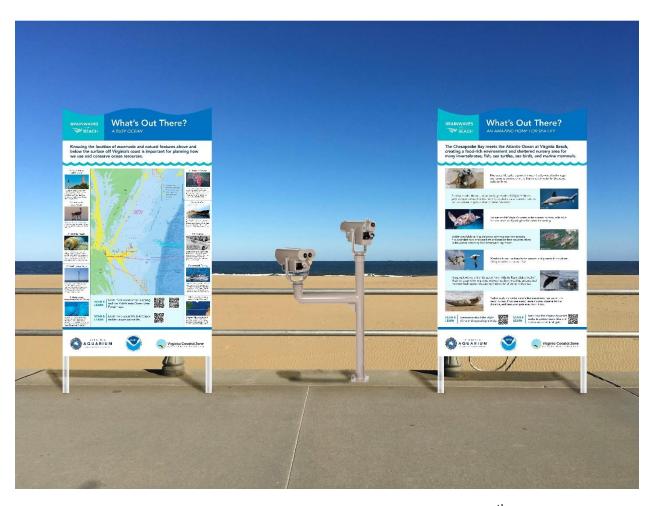
Finally, each exhibit was also designed to include 3-dimensional interactive components to enhance the exhibit experience. With this in mind, outdoor viewing scopes were incorporated into each exhibit. These units are each designed with two scopes to accommodate multi-level viewing options that make them accessible to all. One of the exhibits, *Oceans of Plastic*, also includes additional components in the form of specialty waste and recycling receptacles in keeping with the exhibit theme.



Mark I Dual ADA compliant base, SeeCoast Manufacturing Co.

Exhibit Descriptions

What's Out There?



What's Out There? exhibit (artist rendering) is located at 30th Street on the boardwalk and consists of two graphic panels and a dual telescope/binocular unit.

The first graphic panel is subtitled **A Busy Ocean** and utilizes a map-based perspective to highlight the many human activities and prominent features in the ocean off Virginia. Using photos linked to specific areas of the map, information is presented about shipping, commercial fishing, navigational landmarks, prominent underwater features, wind energy areas, and the Norfolk Canyon. QR codes link to the Mid-Atlantic Ocean Data Portal, Ocean Planning, and information on the Norfolk Canyon.



Knowing the location of manmade and natural features above and below the surface off Virginia's coast is important for planning how we use and conserve ocean resources.









The second graphic panel is subtitled **An Amazing Home for Sea Life** and highlights prominent sea life in the ocean, including marine mammals, birds, sea turtles, fish, and invertebrates. QR codes provide active links to information on critically endangered north Atlantic right whales and the Aquarium's marine mammal and sea turtle stranding response program.



What's Out There?

AN AMAZING HOME FOR SEA LIFE

The Chesapeake Bay meets the Atlantic Ocean at Virginia Beach, creating a food-rich environment and sheltered nursery area for many invertebrates, fish, sea turtles, sea birds, and marine mammals.



Blue crabs' life cycle requires the ocean's salty water for the eggs and larvae to develop and the Bay's brackish water for the young crabs to thrive.

Sandbar sharks, the most abundant large sharks off Virginia's shores, prey on spot and croaker, two bony fishes that are also common catches for recreational anglers and commercial fishermen.





Sea turtles visit Virginia's waters in the summer to feed, with adult females occasionally using local beaches for nesting.

Bottlenose dolphins, Virginia's most common marine mammals, find abundant food and give birth and care for their newborn calves in the coastal waters by the Chesapeake Bay mouth.





Watch for brown pelicans in the summer and gannets in the winter diving headfirst to capture fish.

Humpback whales and endangered North Atlantic Right whales feed off Virginia's coast when migrating between southern breeding grounds and northern feeding grounds, putting them at risk of being hit by ships.





Harbor seals are winter visitors that sometimes haul out on the beach to rest. If you see a seal, leave it alone, observe from a distance, and keep your pets away from it too.



Learn more about the plight of the endangered right whale.



SCAN & LEARN Learn how the Virginia Aquarium works to protect sea turtles and marine mammals in Virginia.



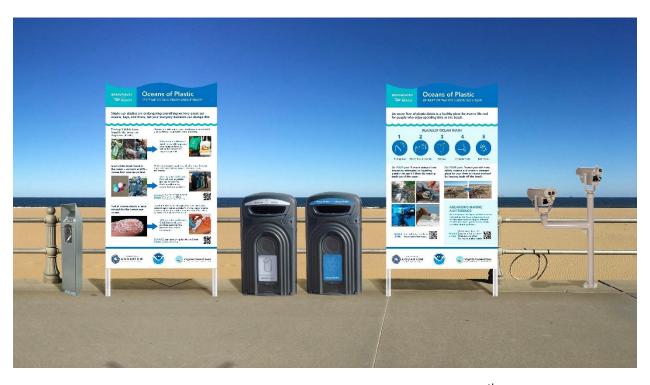






Exhibit Descriptions

Oceans of Plastic



Oceans of Plastic exhibit (artist rendering) is located at 24th Street on the boardwalk and consists of two graphic panels, three specialty waste/recycling receptacles (one each for cigarette litter, recyclable bottles, and general waste), and a dual telescope/binocular unit.

The first graphic panel is subtitled *It's Time to Talk Trash About Trash* and presents information on the most common forms of plastic pollution, including single-use plastic bags, bottles, and food containers. There is also information about balloon litter and the growing threats posed by microplastics. Each section presents actions people can take to address these plastic pollution threats. QR codes provide active links to the Virginia Marine Debris Reduction Plan and a pledge to never release balloons outdoors.



Single-use plastics are endangering everything we love about our oceans, bays, and rivers, but your everyday decisions can change this.









The second graphic panel is subtitled *Be Part of the Pollution Solution* and presents information on ocean trash and its impact on marine life. Graphics and photos illustrate the heavy toll that plastic waste in the ocean can have on marine life due to ingestion and entanglement. QR codes provide links to actions people can take to work for a trash free ocean and to information about how the nation's aquariums are leading efforts to address ocean plastic pollution.



An ocean free of plastic debris is a healthy place for marine life and for people who enjoy spending time at the beach.









AQUARIUMS MAKING A DIFFERENCE

As a member of the Aquarium Conservation Partnership, the Virginia Aquarium is one of many aquariums working to influence policies and inspire guests to take action to reduce plastic pollution.

LEARN

Learn more about the Aquarium Conservation Partnership's effort to reduce marine debris.



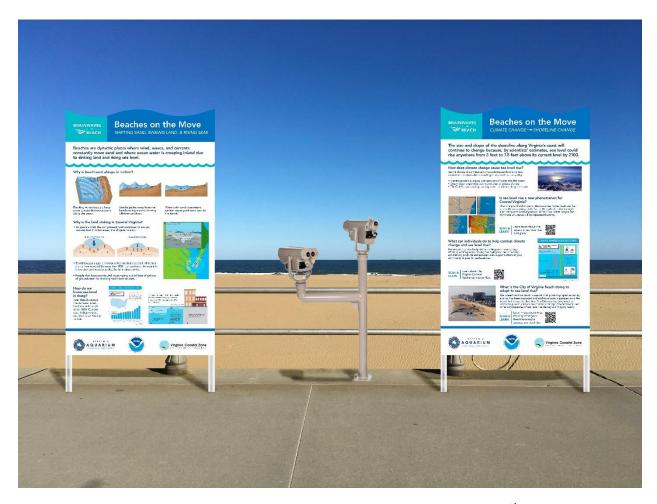






Exhibit Descriptions

Beaches on the Move



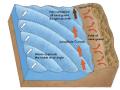
Beaches on the Move exhibit (artist rendering) is located at 16th Street on the boardwalk and consists of two graphic panels and a dual telescope/binocular unit.

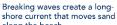
The first graphic panel is subtitled *Shifting Sand, Sinking Land, & Rising Seas* and provides information on the dynamic forces affecting coastal beaches in Virginia. Wind, waves, and currents are constantly moving sand. Ancient events such as ice ages, and even a massive meteor strike, are still affecting the coastline and causing land to sink. Data show how sea level is rising very fast along Virginia's ocean coastlines.



Beaches are dynamic places where wind, waves, and currents constantly move sand and where ocean water is creeping inland due to sinking land and rising sea level.

Why is beach sand always in motion?







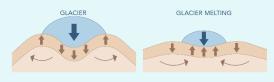
Sand is pulled away from the beach during storms, forming offshore sandbars.



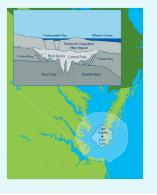
When calm conditions return, gentler waves push sand back to the beach.

Why is the land sinking in Coastal Virginia?

 As glaciers melt, the compressed land underneath rises up, causing land in other areas, like Virginia, to sink.



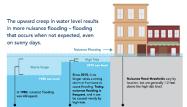
- 35 million years ago, a meteor strike created a crater in this area that is now covered by more than 800 ft of sediment. As debris in the crater continues to settle, the land above sinks.
- People also have contributed by pumping out millions of gallons of groundwater for drinking and industrial uses.



How do we know sea level is rising?

Tide data illustrates the increase in sea level around the US since 1880. Current data indicates that sea level is continuing to rise.











The second graphic panel is subtitled *Climate Change* → *Shoreline Change* and focuses on the impacts of sea level rise in Virginia as a result of climate change. Information is presented on planet warming, glacial melting, and other contributions to sea level rise. QR codes provide active links to the Virginia Coastal Resilience Master Plan and information on sea level rise and the City of Virginia Beach's efforts to protect coastal beaches.



Beaches on the Move

CLIMATE CHANGE → SHORELINE CHANGE

The size and shape of the shoreline along Virginia's coast will continue to change because, by scientists' estimates, sea level could rise anywhere from 3 feet to 7.5 feet above its current level by 2100.

How does climate change cause sea level rise?

Earth's climate is warming as human activities add more carbon dioxide to the atmosphere, resulting in sea level rise caused by:

- Melting glaciers dumping vast amounts of water into the ocean
- Ocean water expanding as it warms due to climate change
- The Gulf Stream slowing, causing water to pile up along the coast.









Is sea level rise a new phenomenon for Coastal Virginia?

Over the past 5 million years, the ocean has moved back and forth across the coast many times due to the cycle of cooler ice ages alternating with warmer periods. What's new is that people and manmade structures will be impacted this time.

SCAN &

Learn more about the impact of sea level rise LEARN in Virginia.



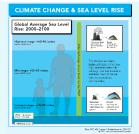
What can individuals do to help combat climate change and sea level rise?

Reduce your carbon footprint by making your home energy efficient, walking more, driving and flying less, and choosing eco-friendly products and services. Also support efforts in your community to plan for sea level rise.

SCAN &

Learn about the Virginia Coastal Resilience Master Plan.







What is the City of Virginia Beach doing to adapt to sea level rise?

The oceanfront boardwalk, a seawall that protects properties during storms, has been upgraded and additional sand is pumped onto the beach to increase its elevation. The City also has developed an extensive plan to address storm water drainage, flooded roads, and other consequences of sea level rise throughout Virginia Beach.

SCAN & LEARN

Learn more about what the City of Virginia Beach is doing to address sea level rise.









Project Summary

The Virginia Aquarium and the Virginia Coastal Zone Management Program developed the *Brainwaves at the Beach: Coastal and Ocean Science Signage* exhibits through a collaborative process. Aquarium staff managed the project design development process and coordinated very closely with CZM Program staff on the exhibit content. This collaborative process allowed for each of the organizations to provide significant input into the final products and ensured that the vision and goals for the project would be achieved.

The Aquarium managed the contracts for production of graphic panels, artistic design, and installation, and the ordering of all exhibit components and supplies. Despite many challenges to staffing and operations imposed by the covid-19 pandemic, the Aquarium team successfully completed all exhibit development tasks, have received and contracted for all exhibit components and supplies, and have all essential services under contract and in place for exhibit placement and installation. Extended production times for fabrication and delivery of exhibit components from key suppliers, apparently due to staffing and supply chain issues, have created uexpected delays. Procurement of all components was complete by December 2021 and all components have been received.

The *Brainwaves at the Beach* exhibits will provide ocean science and conservation outreach experiences for visitors to the Virginia Beach resort area for years to come. The new exhibits will serve as informal education tools that will capture beach-goers' attention, engage their minds, enhance their visits to Virginia Beach, and most importantly, begin to challenge them to consider the impact of their actions on the coastal and ocean environment.

Project Update April 28, 2022

The *Brainwaves at the Beach* exhibits have not yet been installed as of this update. The installation has been delayed by an unexpected review process involving the U.S. Army Corps of Engineers (ACOE) and the City of Virginia Beach Coastal Engineering section. The process involves approval of the concrete anchoring methodology associated with the exhibit components. All components will be mounted in a standard fashion that is common to many existing signs on the Virginia Beach boardwalk. As a result, we believe this review is just a procedural process that must be completed before installation can begin. While we do not yet have a specific date for installation, we are ready to begin as soon as we receive the go ahead from the ACOE. Once started, we expect exhibits installation to be completed within 1-2 days.

The following images show some of the exhibit components and all of the graphic panels with original artwork at the Virginia Aquarium awaiting the approval to proceed with installation.



Nexus 96G recycling receptacle.



Original artwork on recycling receptacle.



Nexus 96G waste receptacle.



Original artwork on waste receptacle.



Photos of completed exhibit panels for What's Out There? exhibit.



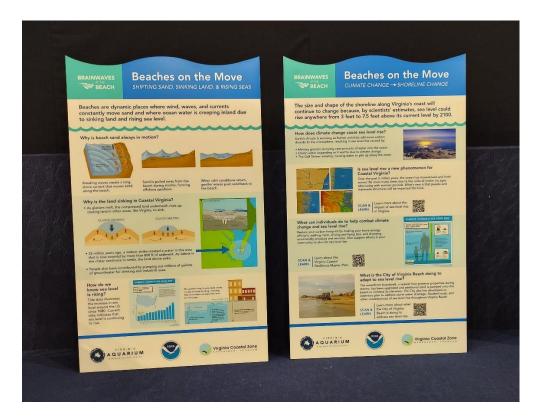
Photos of original artwork on back of What's Out There? exhibit panels.



Photos of completed exhibit panels for *Oceans of Plastic* exhibit.



Photos of original artwork on back of *Oceans of Plastic* exhibit panels.



Photos of completed exhibit panels for Beaches on the Move exhibit.



Photos of original artwork on back of Beaches on the Move exhibit panels.